A.D. 1865, 11*th* APRIL. N° 1028.

Applying Suction and Blast in Furnaces.

LETTERS PATENT to Richard Archibald Brooman, of 166, Fleet Street, in the City of London, Patent Agent, for the Invention of "A NEW METHOD OF APPLYING SUCTION AND BLAST, AND THE APPARATUS EMPLOYED THEREIN."—A communication from abroad by Felix Alexandre Testud de Beauregard, of Paris, France.

Sealed the 11th August 1865, and dated the 11th April 1865.

PROVISIONAL SPECIFICATION left by the said Richard Archibald Brooman at the Office of the Commissioners of Patents, with his Petition, on the 11th April 1865.

I, RICHARD ARCHIBALD BROOMAN, of 166, Fleet Street, in the City of London, Patent Agent, do hereby declare the nature of the said Invention for "A NEW METHOD OF APPLYING SUCTION AND BLAST, AND THE APPARATUS EMPLOYED THEREIN," to be as follows:—

Every body in motion in a medium imparts to that medium a motion in the same direction, whether the body be solid, liquid, or gaseous. Thus a jet of steam projected into the atmosphere imparts to the air a movement in the same direction, which on one side is attraction or suction, and on the other side repulsion; thus, also, the vanes of a fan driving the air by one of their surfaces suck or draw it by the other surface in the same proportion. It is the same in a blowing machine, if the air is repelled on one side it is proportionately sucked or drawn in on the other. Now hitherto only the repelling

or blowing side of these machines has been utilized, the sucking or drawing side having been left inactive; in a few instances this idea has been made use of, but its application has been limited to one or two purposes. I will mention the most important, for this has, so to speak, completely solved the problem. A jet of steam projected into the pipe of a locomotive produces a draught or suction which gives to the fire the intensity necessary for the production of the steam expended in locomotives of great speed. Giffard's injector utilizes in the most rational manner these two forces of a body in motion. This Invention is therefore based on the industrial application of suction acting by inversion from top to bottom in contradistinction to machines hitherto employed, which act by impulsion from bottom to top. I find its principal application is to metallurgical furnaces.

Description and practical working.—Steam is the best agent to employ in this case, steam is therefore directed to the top of the furnace and escapes by orifices in the centre of nozzles, the size of which is in proportion to the speed of suction which it is desired to impart to the air. The number of these jets and nozzles is in direct ratio to the maximum consumption of air in the apparatus. Now the sucking power by vacuum is in conjunction with, first, the manometric tension of the steam; second, its thermometric tension, placing it in a state of complete desaturation; third, the height of its point of exit at the centre of the nozzle; fourth, the angle formed by the cone of the nozzle; thus the apparatus is surmounted with as many nozzles as are necessary. The steam is projected from these nozzles, driving the air before it and producing a suction or vacuum behind. This vacuum becomes active in the body of the apparatus; the ambient air enters from the exterior to the interior with a power in proportion to the inlet orifice, which may be regulated at will, and assimilated to fans or blowing machines of great power. This method dispenses with all mechanical apparatus for introducing air. The steam does not act by transmission, it acts only directly. The operation is entirely inverse in its theory and completely identical in its results. The gaseous products of combustion pass by the nozzles and are projected into the atmosphere with all the power of steam. They may be collected and utilized, and their purity will be so much the greater as the mixture with the steam has been more intimate. With this mode of blowing, as there is no necessity for tuyeres traversing the incandescent fuel, the air may be projected with as much diffusion as is deemed necessary, whereby the present formulæ of combustion will be changed. The combustion will be partial or general, at will, the hot air may be also as easily applied as in former methods, it will suffice to form a communication between the air inlet and the superheating apparatus.

Brooman's New Method of Applying Suction and Blast to Furnaces.

The annexed Drawing represents a melting apparatus surrounded by a double metallic jacket which may be made to contain water and perform the office of a steam boiler. The radiating caloric is utilized for vaporizing the water, the outer surface being heated by the gaseous products of combustion of the apparatus. The steam produced employed for the working of the apparatus, as before explained, is superheated in the pipe B passing to the centre of the flues C, which receive the products of combustion. The same apparatus can produce identical effects hydraulically, and the pressure of the liquid may be produced either by the caloric disengaged from the apparatus, or naturally or artificially, by weight. A, A, are cones the small section of which is regulated according to the speed of the air to be obtained; B is the inlet for the desaturated or superheated steam passing to the centre of the flues C to meet the blowers S; D is the body of the melting apparatus; E, air inlets; G, boiler; S, blower or apparatus projecting gases, vapors, or liquids to the centre of the cone A in order to communicate to the air a part of the speed which they possess.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Richard Archibald Brooman in the Great Seal Patent Office on the 11th October 1865.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, RICHARD ARCHIBALD BROOMAN, of 166, Fleet Street, in the City of London, Patent Agent, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Eleventh day of April, in the year of our Lord One thousand eight hundred and sixty-five, in the twenty-eighth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Richard Archibald Brooman, Her special licence that I, the said Richard Archibald Brooman, my executors, administrators, and assigns, or such others as I, the said Richard Archibald Brooman, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "A NEW METHOD OF APPLYING SUCTION AND BLAST, AND THE APPARATUS EMPLOYED THEREIN," (communicated to me from abroad by Felix Alexandre Testud de Beauregard, of Paris, France,) upon the condition (amongst others) that

I, the said Richard Archibald Brooman, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Richard Archibald Brooman, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, that is to say :—

This Invention consists in a method of applying suction and blast chiefly for metallurgical furnaces. The apparatus is based on the employment of suction or vacuum acting by inversion from top to bottom in contradistinction to apparatuses hitherto employed, which act by impulsion from bottom to top. I employ steam by preference as the sucking agent. The apparatus is surmounted with as many nozzles as are necessary; the steam is directed to the top of the furnace and escapes by orifices in the centre of the nozzles, the size of which is in proportion to the speed of suction which it is desired to impart to the air. The number of these jets and nozzles is in direct ratio to the maximum consumption of air in the apparatus. The steam is projected from these nozzle, driving the air before it, and producing a suction or vacuum behind. This vacuum becomes active in the body of the apparatus; the air enters from the exterior to the interior with a power in proportion to the inlet orifices, which may be regulated at will, and assimilated to fans or blowing machines of great power. This method dispenses with all mechanical apparatus for introducing air. The steam does not act by transmission, it acts only directly. The gaseous products of combustion pass by the nozzles and are projected into the atmosphere with all the power of steam. They may be collected and utilized, and their purity will be so much the greater as the mixture with the steam has been more intimate. It will be understood that in its course the steam will be or may be condensed. With this mode of blowing, as there is no necessity for tuyeres traversing the incandescent fuel, the air may be as much diffused as is deemed necessary, and the combustion may be partial or general. Hot air may be also as easily applied as in former methods; it will suffice to form a communication between the air inlet and an air-heating apparatus.

Figure 1 of the accompanying Drawings represents, as an example, a vertical section of a melting furnace constructed according to this method of

applying suction and blast; Figure 2 is a plan, and Figure 3 a horizontal section. Figures 4 and 5 represent in vertical section and plan a melting furnace furnished with its steam generator.

This apparatus is surrounded by a double metallic jacket *a* supplied with water so as to perform the office of a steam boiler. The interior *b* is intended to receive the fuel and the material to be melted. The products of combustion escape by flues *c*. The melted metal is received in spouts *d*. Air enters through passages *f*, the number of which may be varied at will. Metallic nozzles or cones *g* are arranged at the upper part of the apparatus; their section at the top is regulated according to the speed of the air to be obtained. A blower *h* or similar apparatus projects the gases, vapors, or liquids to the centre of the nozzle *g* in order to communicate to the air a part of the speed which they possess. The radiating caloric is utilized for vaporizing the water in the steam generator. The steam produced employed for the working of the apparatus, as before explained, is superheated in the pipe *i* passing to the centre of the flues *c* which receive the products of combustion. The same apparatus is capable of producing like effects hydraulically, and the pressure of the liquid may be effected either by the caloric disengaged from the apparatus, or naturally or artificially, by weight.

And having now described the nature of the said Invention, and in what manner the same is to be performed, I declare that I claim, applying suction and blast in metallurgical furnaces in manner and by apparatus based upon the employment of suction or vacuum acting by inversion from top to bottom, as herein-before described, in contradistinction to apparatuses which act by impulsion from bottom to top.

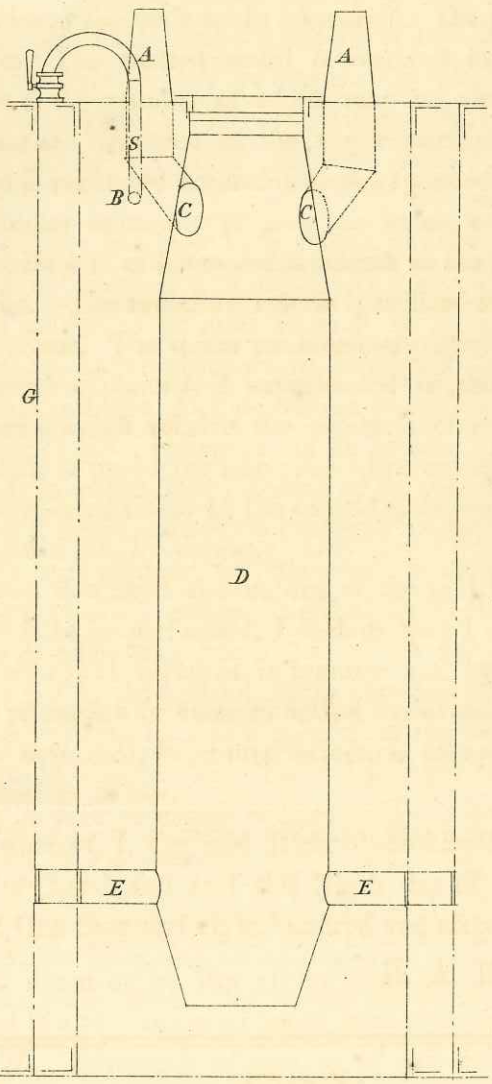
In witness whereof, I, the said Richard Archibald Brooman, hath hereunto set my hand and seal, this Ninth day of October, in the year of our Lord One thousand eight hundred and sixty-five.

R. A. BROOMAN. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1865.

(1 SHEET)

A.D. 1865, April 11, N° 1028,
BROOMAN'S Provisional Specification.



The drawing left with Provisional Specification is partly colored

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Printers to the Queen's most Excellent Majesty 1865.

A.D. 1865. April. 11. N°1028.
BROOMAN'S Specification.

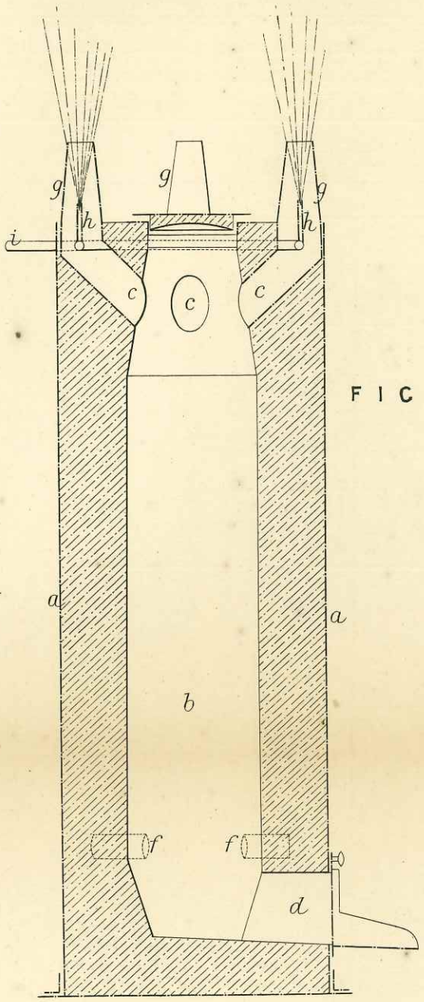


FIG. 1.

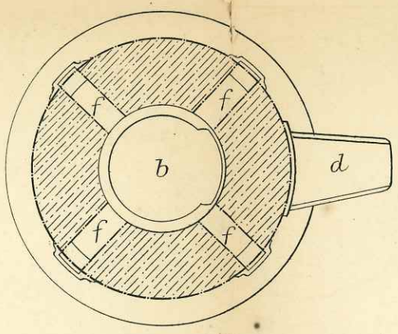
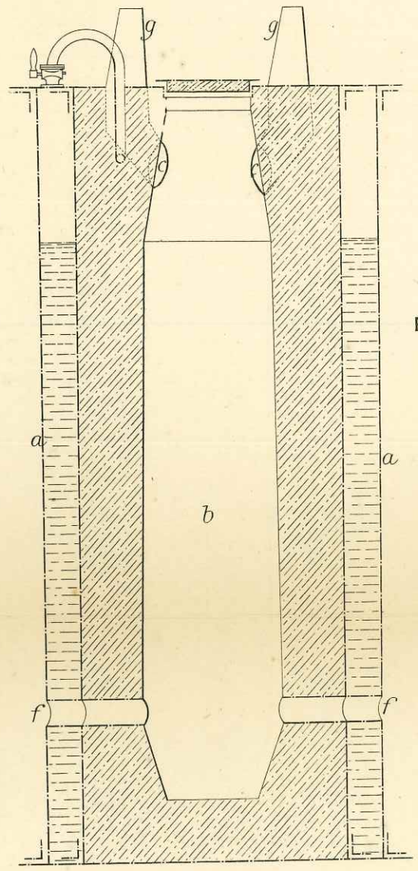


FIG. 3.



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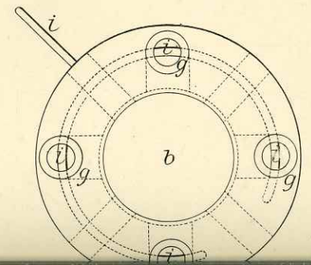

FIG. 2.

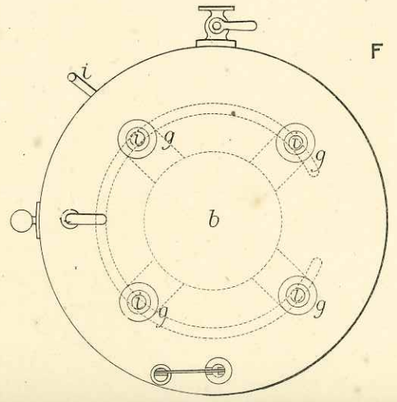

FIG. 5.

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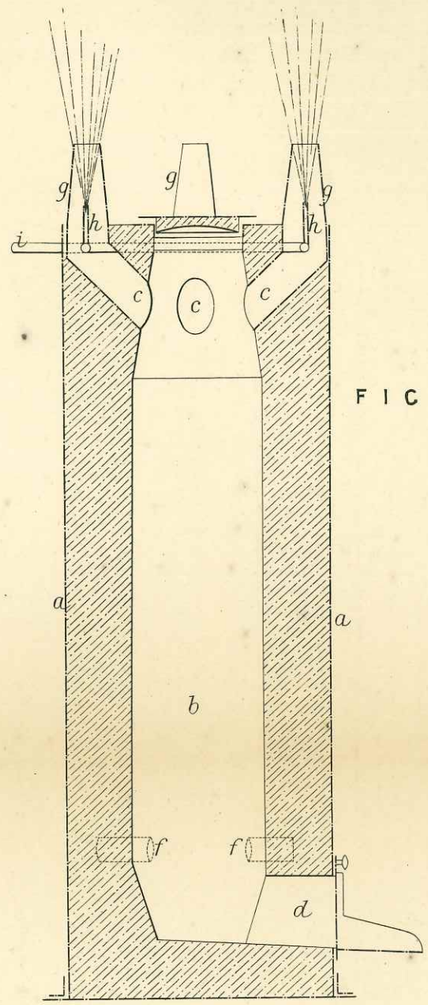


FIG. 1.

FIG. 3.

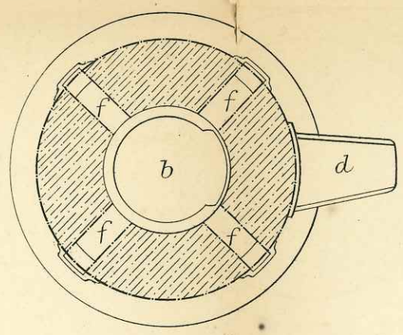
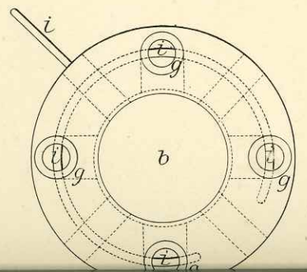
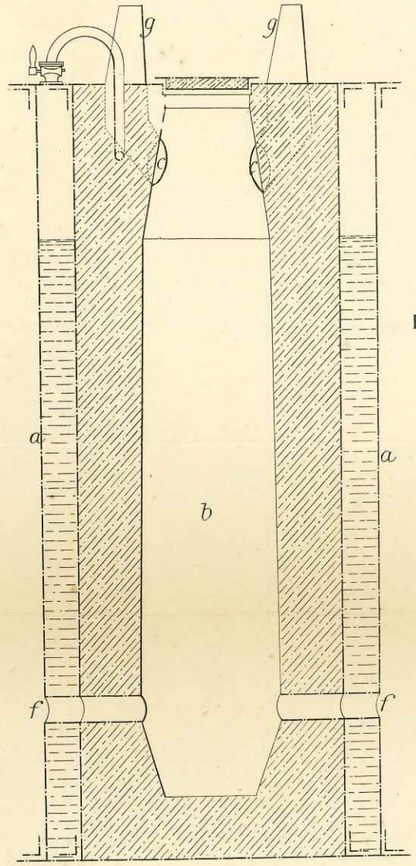


FIG. 2.





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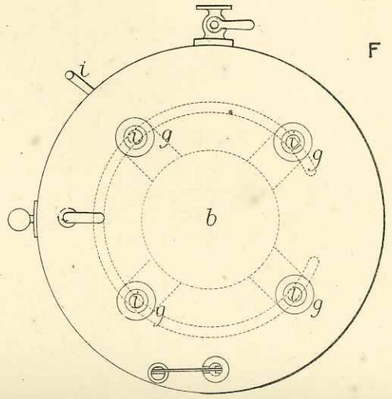

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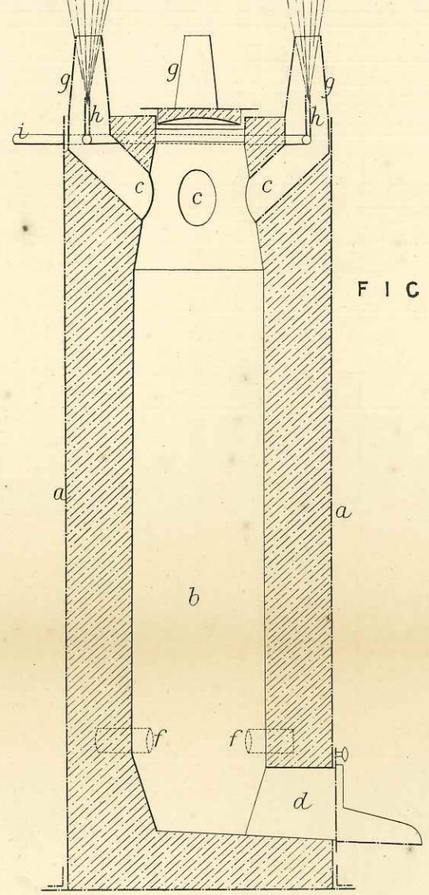
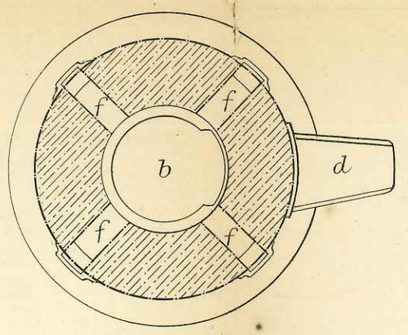


FIG. 1.

FIG. 3.



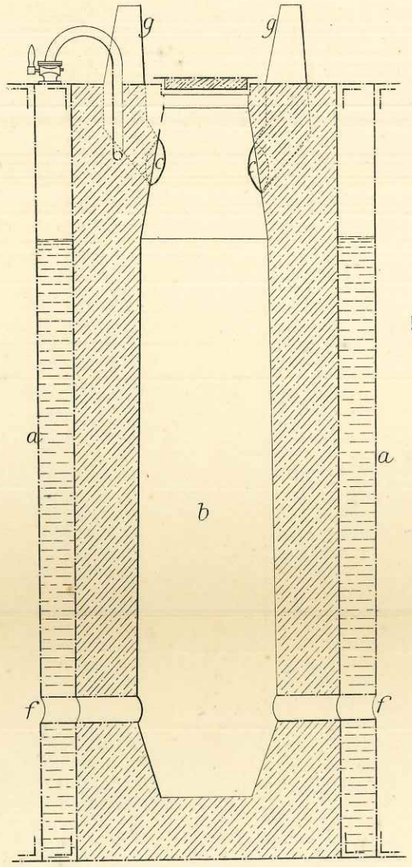
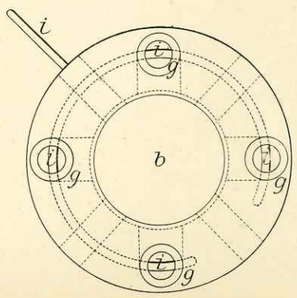


FIG. 4.

FIG. 2.



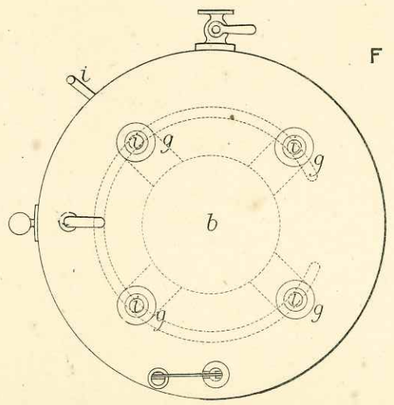


FIG. 5.

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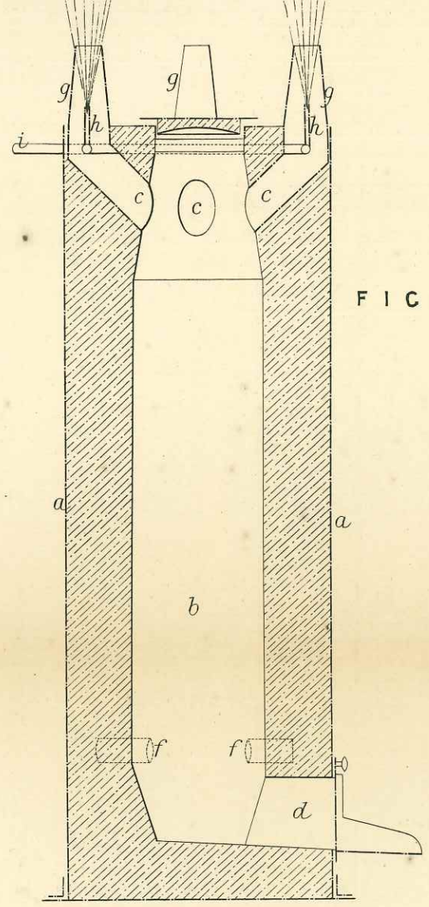
FIG. 1.



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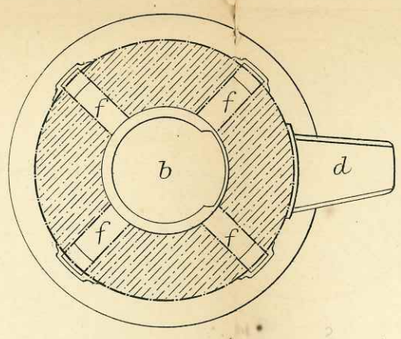

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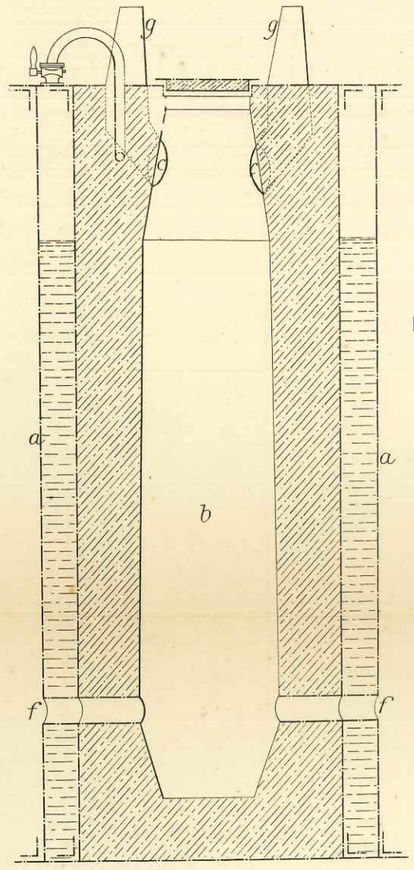

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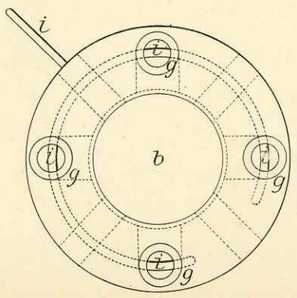

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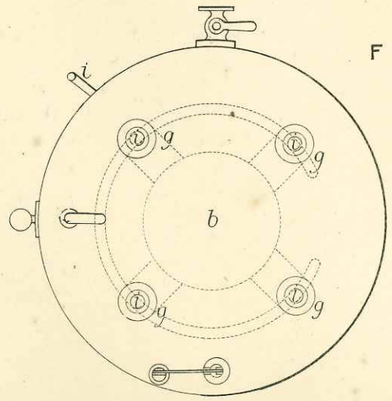

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